August 2009

Energy Services BULLETIN

Western's monthly energy efficiency and renewable energy newsletter dedicated to customer activities and sharing information on energy services.

Alameda, Palo Alto add more landfill power to portfolios

The Ox Mountain Landfill gas-to-energy (LFG) plant roared to life July 1, converting methane from decomposing garbage into 12 megawatts (MW) of base-load electricity for two of California's greenest municipal utilities, the cities of Alameda and Palo Alto.

Owned and operated by the energy services company Ameresco, Inc., the project will generate enough electricity to power nearly 12,000 homes. Alameda and Palo Alto evenly split the project's output with Alameda's half representing about 11 percent of its load and Palo Alto's half being about 4 percent of the city's electric needs.

Perhaps more beneficial to the environment than the green energy the facility produces is the diversion of methane, nitrogen oxide and carbon dioxide from the atmosphere. "By burning methane, which is one of the most potent greenhouse gases, this project has the added benefit of reducing greenhouse gas emissions from the landfill." said Mayor Peter Drekmeier of Palo Alto, who was a speaker at the commissioning ceremony.

Palo Alto city officials at the opening of the Ox Mountain Landfill power project. Back row (l. to r.): Utilities Advisory Commission Chair Dexter Dawes; Sr. Resource Planner Shiva Swaminathan; Mayor Peter Drekmeier; Sr. Assist. City Attorney Grant Kolling; Utilities Dir. Valerie Fong; Utilities Advisory Commission Vice Chair John Melton; Sr. Resource Originator Tom Kabat; former Sr. Resource Planner Karl Knapp, Palo Alto's project lead. Front row (l. to r.): Utilities Resource Management Assist. Dir. Jane Ratchye; Public Communications Mgr. Linda Clerkson.

Previously, landfill owner Republic Services, Inc. flared off the methane, which has been gathering as long as Ox Mountain has collected trash—about 33 years. The company estimates there is enough methane stored in underground pockets to far outlast the landfill's expected lifespan of 25 more years.

Environmental vision

When Ameresco and Republic announced the Ox Mountain Landfill gas conversion project in 2004, the partners did not have to look hard to find buyers for power. "Our previous partnerships with Palo Alto and Ameresco had already established the viability and benefits of LFG for the community," said Alameda Municipal Power General Manager Girish Balachandran. "Because of these unique benefits, we were eager to commit to the development of the Ox Mountain resource."

Alameda has been taking power from Ameresco's Richmond, Calif., LFG plant since 2005 and from the Buena Vista Disposal Site project in Santa Cruz that came online in 2006. These will be joined later this year by a facility at Republic Services' Keller Canyon Landfill, making LFG 22 percent of Alameda's energy mix.

Almost 80 percent of that mix comes from renewable resources, including geothermal and hydropower, earning Alameda the nickname, "Greenest Little Utility in America." Since renewable energy constitutes the bulk of Alameda's generation, the utility does not offer its customers

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a green power premium. "And our rates are 20 to 25 percent lower than in surrounding communities," added Balachandran.

He attributes the utility's success in acquiring renewables to conscientious planning and foresight. "Alameda's public utility board and city council have an environmental vision and strong support from the community," Balachandran explained. "We were green before it was fashionable, so in the case of renewable power, for example, we signed contracts long before the competition for cleaner resources heated up."

Green power leadership

Palo Alto, too, has a history of leadership in renewable energy, currently deriving 19 percent of its electricity from renewable resources beyond the 50 percent from hydroelectric power, some of which Western provides. Utilities Director Valerie Fong shares credit for the city's success with its primary power partner. "Using the scheduling and shaping flexibility of our Western contract enables us to pursue a variety of renewable resources, many of which cannot be shaped to match load," she said.

The power from Ox Mountain will help the city meet its goal of getting 33 percent of its energy needs from new qualifying renewable resources by 2015. To meet that goal, Palo Alto must secure about 130,000 additional MWh per year, and landfill projects will be a significant part of the mix. The city is joining Alameda to purchase power from the Keller project and another LFG facility Ameresco is developing in Chico, Calif., anticipated to go online in 2010.

The Bay Area city first teamed with nearby Alameda and Ameresco to develop the 3.18-MW Buena Vista plant. For their effort, the EPA's Landfill Methane Outreach Program (LMOP) honored them as 2007 Energy Partners of the Year.

Both cities have received recognition individually for their commitment to clean energy, too. Breath California gave Alameda its 2008 Greenhouse Gas Reduction Award, partly due to the city's efforts to develop LFG resources. DOE's Green Power Network has repeatedly included the voluntary PaloAltoGreen program on its top-ranked utility green power programs list for having the highest level of customer participation in the nation. However, like Alameda, Palo Alto includes the landfill gas power in its general energy mix.

Project considerations

More than 400 sites across the country have turned pungent, leaky landfill gas into an asset. The Environmental Protection Agency estimates the potential for 535 more projects, although not all sites are equally suited to development.

In the case of Alameda, a town of 75,000 residents located on an island in the San Francisco Bay, developing its own LFG project is not an option. The island's one small landfill dates back to the community's beginning, and the gas has long since depleted. Also, larger, deeper landfills have greater energy potential, and Balachandran pointed out that the average elevation on the island is only six feet.

The project has to make business sense, as it does at the Palo Alto Regional Water Quality Control plant. The plant saves about $250,000 annually using gas from the city landfill instead of more costly natural gas for its incinerator.

Landfill gas projects heat greenhouses, produce electricity and heat in cogeneration applications, fire brick kilns, supply high-BTU pipeline quality gas, fuel garbage trucks and provide fuel to chemical and automobile manufacturing. According to the Landfill Methane Outreach Project, the facilities have both economic and environmental benefits for communities. To learn more about opportunities landfills present to utilities, contact LMOP.

Energy Services Bulletin

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Challenges, rewards to utilities offering energy audit program

Few energy-saving measures are more cost-effective to consumers than an energy audit. For utilities, energy audits are a steppingstone to reducing energy use during peak hours, not to mention a great way to build customer relationships. Still, most utilities—especially small, understaffed power providers—haven't taken the step of setting up their own audit program.

Many utility Web sites include links to online self-audits, like Touchstone's Home Energy Saver. But energy-savvy consumers who have already visited such sites realize that these programs are merely a good starting point. There is no replacement for a professional armed with knowledge of thermodynamics and construction techniques, an infrared camera, blower doors and a comprehensive audit process. Member services representatives should have a few of these resources, along with the names of trusted contractors on speed dial. If not, you can find them through Energy Star Partners or the Residential Energy Savers Network (RESNET).

Winning over consumers

The trouble is, from a customer service standpoint, anyone with a computer and an Internet connection can find these resources with little or no help. Wouldn't it be great if you could offer your customers a unique service—an on-staff energy auditor, someone who understands how and when they use energy, and what they pay for it?

Nothing builds consumers' trust like having an energy champion on the utility staff, said Western Energy Services Manager Ron Horstman. "Trust translates into more support for programs like demand response and demand-side management, and greater customer participation," he observed. "When a utility has shown ratepayers that it is looking out for their best interests, half the job of selling a new program is done."

Jean Eells, The E Resources Group, far left, conducts energy auditor training sponsored by Corn Belt Power Cooperative for its member co-ops. From left to right: Norm Fandel, Midland Power Cooperative; Dan Huffman, Grundy County REC; and Larry Beilke, Humboldt County REC. (Photo by Corn Belt Power Cooperative)

Horstman added that a utility energy audit program can potentially stimulate local economic development. Audits lead to jobs for contractors installing energy-efficiency upgrades. Small businesses that improve their energy-efficiency benefit from lower operating costs. "And the utility benefits from serving a stable community, not to mention the good will," he said.

No utility approach

Clearly, having a trained energy auditor on staff has many advantages for a utility. Unfortunately, there are almost as many obstacles to finding the right training.

Part of the challenge, noted Horstman, is that there are so many facets to measuring a building's energy use. "Construction, how all the systems and appliances work, both individually and integrated, the occupants' needs all come into it," he said. "I've been doing energy audits for 25 years and I'm still learning."

Another problem is that there is no standard certification—depending on the type of rating system, training can range from a few hours online to weeks in a classroom. "Also, each rating system approaches the audit differently," said Horstman, "and no system specifically represents the utility point of view."

A utility-based energy auditor is uniquely qualified to explain to consumers how rate schedules and demand charges affect their bills, and how time-of-use rates can them save money. Each of these areas offers customers opportunities to change their energy use—and utility bills—for the better. Utilities can also use audits to help entities like school districts or hospital systems aggregate energy purchases to save money.

Systems, training choices

Despite the fact that there is no utility-based energy auditing system, there are still many programs that offer useful training.

The widely-used Home Energy Rating System (HERS) measures energy efficiency in both new and existing homes. "This inspection gives the homeowner a 'miles-per-gallon' assessment of the house, and is often used to determine payback for energy-efficiency upgrades," said Horstman.

The Association of Energy Engineers offers a Certified Energy Manager (CEM) program, which

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focuses more on building systems. Candidates must have a four-year engineering degree or a combination of a degree and energy engineering or management experience. Horstman noted that CEMs tend to approach audits from a building or system commissioning standpoint.

BOMA Energy Efficiency Program—BEEP for short—is a program offered by the Building Owners and Managers Association. Developed in cooperation with Energy Star, the webinar-based training covers energy audit concepts as well as strategies for reducing energy use and costs. Participants can download webinars at their convenience, but won't receive any hands-on training with audit tools. BOMA recommends the program for any professionals who are responsible for energy efficiency, but the training has a specific focus on facilities management.

More training options

More extensive training is available from the Environmental Outreach and Stewardship (EOS) Alliance and Building Performance Institute. Building Analyst Training and Certification for Residential Energy Auditors and Weatherization Professionals, a three-week programs that includes a week of field instruction, begins Sep. 21 in Seattle. The program teaches students to perform a comprehensive home energy audit and prepares them for the BPI Building Analyst certification exam, a 100-question written test with a two-hour field exam.

Prerequisites for the program, which are not as stringent as those for CEM training, include basic math skills and good physical condition. A general familiarity with home framing, insulation and structural components is recommended, but not required. Students may also choose to take a portion of the total course.

A few targeted classes or workshops may be the best training investment for utilities that already have an employee with some of the skills needed to perform energy audits. Look for courses on residential weatherization, industrial systems or training for auditing equipment like infrared cameras or blower doors, depending on the focus of your program.

States and counties may offer energy auditor training, so check with your regional energy office. One advantage of locally-offered programs is that they will often cover local building codes. On the downside, Horstman points out, jurisdictions that have not adopted the most recent building codes often address energy-efficiency only minimally.

Western-sponsored training

When it comes to energy auditing, it seems that finding time and money for training can be as much a barrier as finding the right kind of training. So Energy Services wants to know: If Western hosted a workshop, would our customers come?

Would your utility consider sending an employee to a four-day Level 1 IR thermography certification class, or a two-day IR basics/weatherization workshop? With Western absorbing some of the expense, student enrollment fees would be about $1,000 for Level 1 certification or about $400 for the weatherization course. Utility members would be welcomed, too.

The catch is that we would need a commitment from at least 12 students. Contact your Energy Services representative if your utility would like to attend one of these workshops. If there is enough interest, Western would consider offering more training to help our customers add this valuable service to their energy management tool box.

Learn to use IR camera

One of the most valuable types of training is infrared (IR) thermography. Not only is an IR camera central to on-site energy audits, utilities will find many other applications for thermography.

IR camera manufacturer FLIR Systems offers training through its Infrared Training Center (ITC). Courses cover basic to advanced thermography, building inspection, weatherization and more. ITC advises attendees to take the online tutorial in camera operation before attending an instructor-led class.

ITC schedules classes throughout the year at locations across the country, although there are few that take place in Western territory. The cost for Level 1 certification is $1,750.

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2009/aug/aug092.htm

Utilities invited to test transmission modeling tool

In building a renewable energy project, the big questions facing developers and utilities alike are, where are the best resources, how do we deliver the energy to our load and how much will it cost. The Western Renewable Energy Zone (WREZ) initiative is compiling data and designing analytical tools to answer those questions, and you have the opportunity to help.

In cooperation with Western and the National Renewable Energy Laboratory (NREL), the WREZ project is presenting a webinar on how to use its new generation and transmission modeling tool (GTM), Aug. 19, 2009, at 11 a.m. MDT. The GTM allows users to evaluate the relative economic costs, including transmission, of delivering renewable energy from proposed sites to load centers. The cost of the webinar is free, and Paula Fronk urges Western customers to participate. "This is an amazing tool that removes much of the guesswork from figuring out whether or not a specific renewable energy project will work in the utility's situation," explained the Western Energy Services representative.

Jerry Vaninetti, co-chair of the modeling team and vice president of transmission developer Trans-Elect, said the GTM will also encourage collaboration between power providers in the West. "The model can show utilities where they can team up to achieve economies of scale on larger transmission lines needed to reach remote resources," he explained. "Sharing development and transmission costs could give them access to rich sites that wouldn't be available to individual utilities. Such partnerships could ultimately bring down the cost of renewable energy to customers."

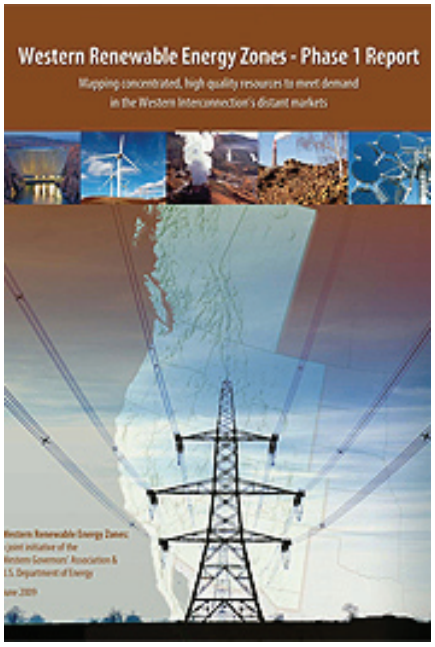
Feedback from training

The WREZ committee hopes the training session will encourage utility planners, renewable energy developers, environmental groups, policy makers and others to "test drive" the GTM and offer feedback on possible improvements. Webinar participants will get a thorough introduction to the 2.0 version of the modeling tool that is currently online.

The GTM is an Excel-based screening tool that offers users a list of resources to select or the option of creating a resource. Users then choose pre-defined transmission lines and routes to deliver the energy to load zones. The program calculates a variety of transmission characteristics to give users the delivered price of power from a specific renewable energy zone (REZ). Users can modify inputs such as transmission line capacities and capital costs, right-of-way costs, substation capital costs, operation and maintenance costs and transmission losses to evaluate different scenarios

Fronk believes that the model's flexibility will be a boon to utilities going through the integrated resource planning (IRP) process. "Up to now, our customers could only estimate the cost of adding renewable resources to their portfolios, or spend a lot of time researching markets," she said. "With the GTM, they can plug in their own numbers to quickly get a more precise picture of how a particular resource fits their needs. This tool could streamline planning and make IRPs more accurate, so it is important for our customers to be a part of its development."

Feedback from webinar participants will provide the modeling team with more insight on the needs of utility users, said Jeff Hein of the Colorado Public Utilities Commission. The staff professional engineer and commission energy advisor is on the WREZ technical committee and part of the modeling team. "The GTM is especially useful in that it marries generation and transmission planning, and these are areas where utilities have extensive day-to-day experience," he said.



The Phase 1 Report from the Western Renewable Energy Zone initiative contains maps used in developing the generation and transmission modeling tool. (Art by Western Governors' Association)

The release of GTM 2.0 marks the end of the second phase of the WREZ initiative, but the model will be periodically updated. "We'll be incorporating feedback from users and adding new resource data as it becomes available," Hein said. "Like any good program, the GTM will continue to evolve."

Renewable future

The Western Governors' Association (WGA) and the Department of Energy launched the WREZ initiative in May 2008. Building on the work of WGA's Clean and Diversified Energy initiative, the goal of WREZ is to encourage development of the abundant renewable resources within the Western Interconnection.

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Technology Spotlight:

Organic Rankine Cycle harness moderate waste heat for combined heat and power

Chena Hot Springs Resort entered into a partnership with United Technologies Corporation (UTC) to demonstrate their moderate temperature geothermal ORC power plant technology at Chena Hot Springs. (Photo by Chena Hot Springs)

Many industrial processes result in waste heat at temperatures less than 1,000°F. Combined heat and power systems (CHP) can cost-effectively recover this heat to serve onsite thermal needs directly. But if the facility does not have a direct application for the heat, a CHP based on traditional steam turbine cycle systems cannot use such low-grade heat to produce electricity. On the other hand, Organic Rankine Cycle (ORC) turbine systems may feasibly generate electricity from waste heat at moderate temperatures (between about 200°F and 750°F).

Established technology

ORC turbines are an established technology with a long history, primarily at geothermal installations. Ormat—just one of several manufacturers—has installed more than 800 MW of total capacity over the last 40 years, and demonstrated equipment life spans of 20 to 30 years without major overhaul. As equipment costs decline and energy costs increase, ORC systems are being used in industrial applications to recover heat from process heating exhausts, reciprocating engines, gas turbines, thermal oxidizers and kilns.

Technology description

ORC systems and steam systems both have four primary components: a boiler or evaporator to evaporate the working fluid, a turbine fed with vapor from the boiler to drive the generator, a condenser or other means of condensing the exhaust vapors from the turbine, and a unit (such as a pump) for recycling the condensed fluid to the boiler. In a steam cycle, water circulates through these components as the working fluid. In an ORC system, the working fluid is a liquid that has a lower boiling point than water, typically a refrigerant such as R134a or R245fa, silicon oil, ammonia or a hydrocarbon such as iso-pentane.

ORC systems can also be compared to air conditioning systems operating in reverse. In fact, some designs of ORCs make use of standard heating, ventilation and air-conditioning (HVAC) equipment, reducing cost by taking advantage of off-the-shelf technology. For example, in early 2007, Carrier Corporation and United Technologies Corporation (UTC) began marketing an ORC system derived from a centrifugal compressor design. Much like large HVAC equipment, ORC systems are available as packaged, modular units, and so are relatively easy to transport, install and interface with the hot and cold sources on site.

Most ORC systems range in size from 50 kW to about 2 MW. Smaller units, down to 5 kW, are either under development or have recently entered the market.

Required temperature

The capacity and cost effectiveness of the system generally increase with source temperature. The minimum economic source temperature depends on factors such as the manufacturer's equipment design, flow rate of the waste stream, the temperatures of both the heat source and the heat sink (i.e., the cooling source for the ORC), and the cost of electricity. At least three manufacturers—Infinity, UTC and ElectraTherm—build ORC systems that can operate with waste heat temperatures less than 200°F. Maximum temperatures also vary by manufacturer but can be as high as about 750°F. In addition to minimum and maximum source temperature, a minimum temperature difference between the source and sink is required. Ormat's "OEC," for example, requires a temperature difference of at least 100°F.

Cost

Installed costs vary widely, depending on size and on the available temperature difference between the heat source and sink. Typically, installed cost will range from $2,000 to $4,000 per kilowatt and can be as low as about $1,300 per kilowatt. This is pricier than a reciprocating engine, but the greater installed cost may be offset by its low maintenance costs and zero fuel use. UTC reports that their geothermal demonstration project at Chena Hot Springs, which used an HVAC-derived ORC, demonstrated that the cost of power production using ORCs can be reduced to below 5¢ per kWh.

Maintenance costs per kilowatt-hour are typically a fraction of comparably sized fossil-fuel generators because of their lower speeds, closed loop and few moving parts. Maintenance and repair activities

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Web site of the month:

Home Energy Saver http://heslbl.gov

As with dieting, the first step toward reducing a building's energy consumption is to measure it. While consulting with a professional—trained nutritionist or certified energy auditor—may get the best results, consumers usually take the do-it-yourself approach. So, like a doctor giving a patient a calorie counter, many utilities provide links on their Web sites to online energy auditing systems.

An excellent program homeowners can use to get a handle on their energy consumption is the Home Energy Saver (HES), developed by Lawrence Berkeley National Laboratories. Using basic information entered by the visitor, the HES compares the home's energy efficiency to similar homes across the country.

Visitors begin the process by simply entering their zip code, and in turn receive instant initial estimates. Each session is assigned a number so visitors can save their information and return to update their profile—a very useful feature since online audits often show consumers how little they understand about their own utility bill.

Covers whole house

Using engineering models, the HES Energy Advisor estimates energy consumption for six end uses: heating, cooling, water heating, major appliances, lighting, and miscellaneous equipment.

The Energy Advisor calculates heating and cooling consumption using the DOE-2 building simulation program, developed by the U.S. Department of Energy. The program performs a full annual simulation for a typical weather year in about 10-20 seconds, after the visitor enters the necessary information describing their home. Visitors can choose from 239 weather locations around the United States. The Web-based user interface distills a sophisticated series of calculations into a relatively simple, useful form. Default energy prices for each fuel and state are also available, or visitors can enter their specific pricing information.

Home Energy Saver online energy auditing program shows consumers the profitability of energy-efficiency upgrades. (Artwork by Home Energy Saver)

LBNL researchers developed the detailed model that calculates domestic water heating energy consumption. Visitors can see how household size, age of occupants, equipment efficiencies and water inlet temperatures affect bottom-line energy costs.

To get appliance estimates, visitors can simply enter the number and approximate age of their major appliances. Another, very detailed module calculates energy consumption for lighting and dozens of miscellaneous gas and electric appliances, with default values based on data compiled over the years by LBNL researchers.

What happens next

The initial results compare the energy costs for each of the six end uses the visitor currently has with the energy cost of upgrades. The recommendations are tailored to the visitor's home and ranked by payback time. On this page, visitors can select from a dropdown menu to modify assumptions, as well as the retrofit costs and then recalculate the table.

The results can be viewed online or printed out in a detailed report which includes retrofit description and other details as well as links to additional information. This data can help consumers to make informed decisions about home improvements, while member services representatives can point to the report to show the benefits of utility rebates.

Of course, the point of providing information is to get people to take action, and visitors can take the next step with the HES Making it Happen and Energy Librarian modules. These pages connect users to a wide variety of online "how-to" resources, so they can successfully capitalize on the energy savings opportunities identified by the Energy Advisor. Links range from lists of specific efficient products to tips about selecting a good contractor to information on what assistance utilities might have to offer. The site also features an extensive glossary and frequently-asked questions. If visitors don't find the answers they are looking for there, a link will take them to DOE EERE's Ask An Energy Expert Service.

Utilities should encourage consumers who are serious about improving their home's energy performance to consult a professional energy auditor. But don't underestimate the value of online audits like the Home Energy Saver. It shows consumers what they can achieve—a lean, mean utility bill and a more comfortable home.

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2009/aug/aug095.htm

Transmission modeling tool *from page 5*

Phase 1 identified the most promising areas—those with the most energy potential that could be tapped with the least environmental impact—and determined transmission needs and costs. The Western Electricity Coordinating Council, renewable energy developers, tribal representatives, utility planners, environmental groups and government policymakers all contributed to the Phase 1 Report, released June 15, 2009.

The report includes a map of the resource-rich areas that can be used to estimate their distance to load zones. The map is a key part of the GTM developed by energy consultants Black & Veatch, with input from NREL, Lawrence Berkeley National Laboratory, WGA and utility transmission and regulatory experts. The team is also working on a Peer Analysis Tool that can create a supply curve to any individual load center with the entire list of renewable resources from all REZs in the Western Interconnection.

These tools will facilitate the third phase of the WREZ initiative, stimulating development of commercial G&T projects, or modification of existing proposed projects, to deliver REZ power. The fourth and final phase will engage political, industry and stakeholder leaders across the region to cooperate on permitting multi-state generation-transmission projects and resolving cost allocation issues.

Webinar for all

This is all good news for utilities scrambling to comply with renewable portfolio standards, meet growing customer demand for clean energy and prepare for climate change legislation. Unfortunately for some Western customers, the tool only works for the 11 states, two Canadian provinces, and areas in Mexico served by the Western Interconnection. Customers from Iowa, Kansas, Minnesota, Nebraska and the Dakotas are welcomed to participate in the webinar, however.

Reservations or registration for the WREZ modeling webinar are not required. Join the meeting online Aug. 19 at 11 a.m. MDT. The username and conference code are both 7196252. You do not need to call into the audio conference or install the program. Users will be prompted to run the "light version," which requires that the computer have Java and Active X controls. Once the moderator arrives, the service will automatically dial your phone number or prompt you to join the audio broadcast. Please contact Jagmeet Khangura at 925-949-5966 with questions.

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Technology spotlight *from page 6*

include replacing filters, checking oil, lubricating engine parts and recharging the working fluid. ORCs operate at a lower pressure than steam turbines and so generally, no operator attendance is required.

Cost effectiveness can be improved by recovering heat from the ORC's condenser to produce hot water or to meet air conditioning or refrigeration needs using an absorption chiller. Also, incentives may be available for installation of ORC systems. Thirteen states now include combined heat and power or waste heat recovery as an eligible resource to meet renewable portfolio standards.

Manufacturers

ORC systems available in the U.S. include Infinity Turbine, Ormat, UTC Power, ElectraTherm, Cryostar and Barber-Nichols.

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